Amendment of Claims under Article 34

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C L A I M S

1. (amended) A feedback control method of performing disturbance recovery control by giving a manipulated variable to a controlled system so as to make a controlled variable recover to a set point at the time of application of a disturbance, characterized by comprising:

the step of dividing a response process of disturbance recovery control into three stages including a follow-up phase, a convergence phase, and a stable phase;

the first phase switching step of switching to the follow-up phase at a disturbance application detection time point as a start time point of the follow-up phase;

the follow-up phase manipulated variable determination step of continuously outputting a manipulated variable which makes the controlled variable follow up the set point in the follow-up phase;

the second phase switching step of switching to the convergence phase at a disturbance recovery control elapsed time point, as a start time point of the convergence phase, at which the controlled variable does not exceed the set point in the follow-up phase;

the convergence phase manipulated variable determination step of continuously outputting a

manipulated variable which makes the controlled variable converge near the set point in the convergence phase so as to prevent a control response waveform from being disturbed before and after a switching time point between the follow-up phase and the stable phase;

the third phase switching step of switching to the stable phase at a time point, as a start time point of the stable phase, at which a preset state is reached in the convergence phase; and

the stable phase manipulated variable determination step of continuously outputting a manipulated variable which makes the controlled variable stable at the set point in the stable phase.

2. A feedback control method according to claim 1, characterized in that the first phase switching step comprises the step of setting a time point, as the start time point of the follow-up phase, at which it is confirmed on the basis of a deviation between a set point and a controlled variable that a disturbance has been applied.

3. A feedback control method according to claim 1, characterized in that the first phase switching step comprises the step of setting a time point, as the start time point of the follow-up phase, at which a phase switching signal is input from an external unit which notifies application of a disturbance.

4. A feedback control method according to

claim 1, characterized in that the second phase switching step comprises the step of calculating a predicted value of a remaining time for attainment which is a time taken for a current controlled variable to reach the set point in the follow-up phase, on the basis of a deviation between the set point and the controlled variable and a controlled variable change ratio, and the step of setting a time point, as the start time point of the convergence phase, at which the calculated predicted value of the remaining time for attainment becomes smaller than a preset time index.

5. A feedback control method according to claim 1, characterized in that the third phase switching step comprises the step of setting a time point, as the start time point of the stable phase, at which a preset time index has elapsed.

6. A feedback control method according to claim 1, characterized in that the follow-up phase manipulated variable determination step comprises the step of continuously outputting a preset manipulated variable.

7. A feedback control method according to claim 1, characterized in that the convergence phase manipulated variable determination step comprises the step of continuously outputting a preset manipulated variable.

8. (amended) A feedback control device for

dividing a response process of disturbance recovery control into three stages including a follow-up phase, a convergence phase, and a stable phase and performing disturbance recovery control by giving a manipulated variable to a controlled system so as to make a controlled variable recover to a set point at the time of application of a disturbance, characterized by comprising:

a first phase switching unit which switches to the follow-up phase at a disturbance application detection time point as a start time point of the follow-up phase;

a second phase switching unit which switches to the convergence phase at a disturbance recovery control elapsed time point, as a start time point of the convergence phase, at which the controlled variable does not exceed the set point in the follow-up phase;

a third phase switching unit which switches to the stable phase at a time point, as a start time point of the stable phase, at which a preset state is reached in the convergence phase;

a first manipulated variable determining unit which continuously outputs a manipulated variable which makes the controlled variable follow up the set point in the follow-up phase;

a second manipulated variable determining unit which continuously outputs a manipulated variable which

makes the controlled variable converge near the set point in the convergence phase so as to prevent a control response waveform from being disturbed before and after a switching time point between the follow-up phase and the stable phase; and

a third manipulated variable determining unit continuously outputs a manipulated variable which makes the controlled variable stable at the set point in the stable phase.

9. A feedback control device according to claim 8, characterized in that said first phase switching unit sets a time point, as the start time point of the follow-up phase, at which it is confirmed on the basis of a deviation between a set point and a controlled variable that a disturbance has been applied.

10. A feedback control device according to claim 8, characterized in that said first phase switching unit sets a time point, as the start time point of the follow-up phase, at which a phase switching signal is input from an external unit which notifies application of a disturbance.

11. A feedback control device according to claim 8, characterized in that said second phase switching unit calculates a predicted value of a remaining time for attainment which is a time taken for a current controlled variable to reach the set point in the follow-up phase, on the basis of a deviation between

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the set point and the controlled variable and a controlled variable change ratio, and sets a time point, as the start time point of the convergence phase, at which the calculated predicted value of the remaining time for attainment becomes smaller than a preset time index.

12. A feedback control device according to claim 8, characterized in that said third phase switching unit sets a time point, as the start time point of the stable phase, at which a preset time index has elapsed.

13. A feedback control device according to claim 8, characterized in that said manipulated variable determining unit continuously outputs a preset manipulated variable.

14. A feedback control device according to claim 8, characterized in that said second manipulated variable determining unit continuously outputs a preset manipulated variable.